



Section 1. (1 point each)

Mark the following statements with True if they are true and False otherwise.

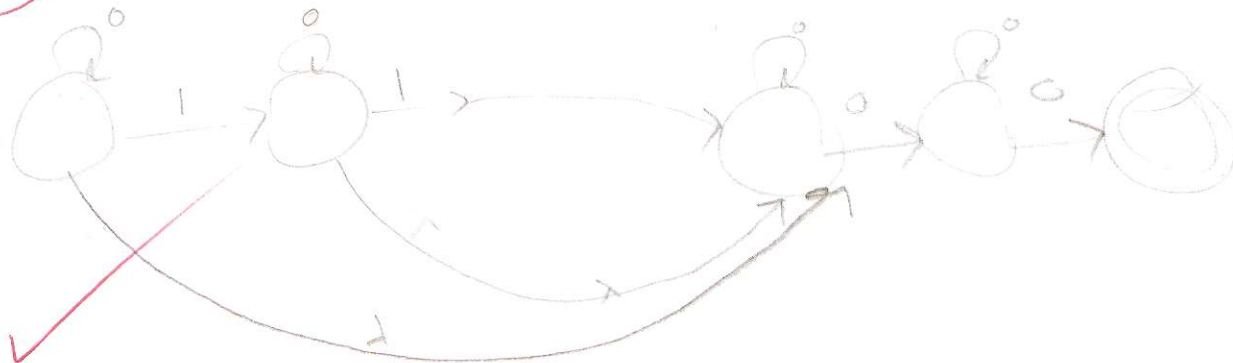
- 8**
- ☒ F Some DFAs cannot be converted to NFAs.
  - ☒ F A nondeterministic finite automaton (NFA) has a finite number of states, but the number of productions can be infinite.
  - ☒ I The grammar  $S \rightarrow aSb|aaSb|\lambda$  generates the language  $L = \{a^n b^m : 0 \leq n \leq 2m\}$ .
  - ☒ I All finite languages are regular.
  - ☒ F For any language  $L$ , the following is true  $L \neq L^2$ .  $\rightarrow L = \{a\}^* \rightarrow L^2 = \{a\}^*$
  - ☒ I The language  $L = \{w \in \{0,1\}^+ : \text{the number of 1's in } w \text{ is divisible by } 1035\}$  is regular.
  - ☒ I The language  $L((0+1)^*1(0+1)^*1(0+1)^*)$  denotes the language comprised of all strings with at least two 1's. *how or more*
  - ☒ I The language  $L = \{a^n b^m : (n+m) \text{ is odd}\}$  is regular.
  - ☒ F  $|L((a+b)(a+b)(a+b) \cdot \lambda)| = 8$ . *{a,b}^3 {a,b}^3 {a,b}^3*
  - ☒ F The regular expression  $(11+0)^*$  denotes all words with an even number of 1's.

Section 2. (5 points each)

1. Show that the language

$$L = \{w \in \{0,1\}^* : w \text{ contains at most two 1's and ends with } 00\}$$

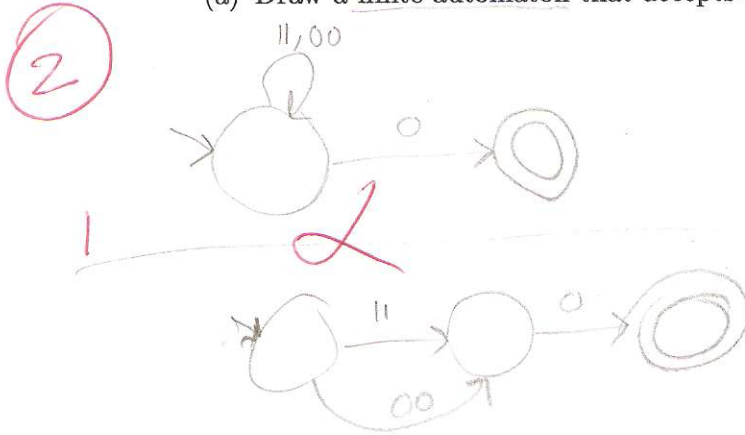
is regular.



2. Consider the following regular expression.

$$r = (11 + 00)^*0$$

(a) Draw a finite automaton that accepts the language  $L(r)$ .



(b) Which of the following strings is generated by this regular expression?

- i. 10100  
ii. 1100110011  
iii. 11111  
iv. 11000

3. Find a regular expression for the language

$$L = \{w \in \{0, 1\}^* : n_0(w) \text{ is even and the string starts and ends with } 1\}.$$

3

$$(1^* 0^* 1^* 1)^* + 1$$

4. Construct a grammar for the language

$$L = \{w \in \{a, b, c\}^+ : w = w^R\}$$

$S \rightarrow aSa \mid bSb \mid cSc \mid a \mid b \mid c$

$\Delta - 1$

$aa \quad cc \quad bb$   
-1

$abccba$   
 $abccba$

5. Convert the following NFA to a DFA that accepts the same language.



$q_0 \xrightarrow{a} q_1, q_0$   
 $q_0 \quad q_1 \xrightarrow{a} q_0, q_1$   
 $q_0 \quad q_1 \xrightarrow{b} q_1, q_2$   
 $q_1 \quad q_2 \xrightarrow{a}$

